WHAT IS CLAIMED IS:

1. An apparatus for blending an acid and a base to form a mixture, comprising:

(a) a chamber;

(b) a distribution-blending-cooling dish suspended therein;

(c) an acid delivery system for introducing the acid into the chamber and to the distribution-blending-cooling dish; and

(d) a base delivery system for introducing the base into the chamber via the distribution-blending-cooling dish;

wherein the acid and the base are mixed within a thin layer on the distribution-blending-cooling dish, and then *in situ* mixing occurs within the chamber below the distribution-blending-cooling dish.

2. The apparatus of claim 1, wherein the acid comprises sulfuric acid.

3. The apparatus of claim 1, wherein the acid is diluted in water.

4. The apparatus of claim 1, wherein the base comprises calcium hydroxide.

5. The apparatus of claim 1, wherein the base is mixed in water to form a slurry.

6. The apparatus of claim 1, wherein an inside surface of the chamber comprises a non-corrosive coating.

7. The apparatus of claim 6, wherein the corrosive coating comprises a derivative of fluro polymers.

8. The apparatus of claim 6, wherein the non-corrosive coating comprises ethyl tetraflouro ethylene.

9. The apparatus of claim 1, further comprising a chamber cooling coil coupled to the chamber to lower temperature of the chamber.

10. The apparatus of claim 9, further comprising a chamber temperature sensor, coupled to the chamber, the chamber temperature sensor sensing temperature of the chamber, and the chamber cooling coil cooperating with the chamber temperature sensor to regulate the temperature.

11. The apparatus of claim 1, further comprising a dish cooling coil coupled to the distribution-blending-cooling dish, to lower temperature of the distribution-blending-cooling dish.

12. The apparatus of claim 11, further comprising a dish temperature sensor, coupled to the distribution-blending-cooling dish, wherein the dish temperature sensor senses the temperature of the distribution-blending dish and the dish cooling coil cooperating with the dish temperature sensor to regulate the temperature of the distribution-blending-cooling.

13. The apparatus of claim 1, wherein the distribution-blending-cooling dish is of an adequate size and shape to allow broad distribution of the acid and the base components, and wherein cooling of the mixture occurs.

14. The apparatus of claim 1, wherein the distribution-blending-cooling dish is of a minimal depth and shape to allow broad distribution of the acid and the base components, and wherein cooling of the mixture occurs.

15. The apparatus of claim 1, wherein the distribution-blending-cooling dish comprises a non-corrosive coating.

16. The apparatus of claim 15, wherein the non-corrosive coating comprises a derivative of fluro polymers.

17. The apparatus of claim 15, wherein the non-corrosive coating comprises ethyl tetraflouro ethylene.

18. The apparatus of claim 1, wherein the acid delivery system comprises a spray mechanism.

19. The apparatus of claim 1, wherein the acid delivery system comprises in-air mixing.

20. The apparatus of claim 19, wherein the in-air mixing diminishes the mixture from adhering to an inside wall of the chamber in large amounts.

21. The apparatus of claim 19, wherein the in-air mixing diminishes the mixture from generating hard particles.

22. The apparatus of claim 21, wherein the hard particles comprise un-reacted base.

23. The apparatus of claim 21, wherein the hard particles comprise encapsulated hydroxide.

24. The apparatus of claim 1, wherein the base delivery system comprises a spray mechanism.

25. The apparatus of claim 1, wherein the base delivery system comprises in-air mixing.

26. The apparatus of claim 25, wherein the in-air mixing diminishes the mixture from adhering to an inside wall of the chamber in large amounts.

27. The apparatus of claim 25, wherein the in-air mixing diminishes the mixture from generating hard particles.

28. The apparatus of claim 27, wherein the hard particles comprise encapsulated hydroxide.

29. The apparatus of claim 27, wherein the hard particles comprise un-reacted base.

30. The apparatus of claim 1, wherein a slurry is formed with the base to promote base delivery.

31. The apparatus of claim 1, wherein the acid delivery system comprises:

(a) an acid pump; and

(b) an acid delivery nozzle, wherein the acid pump and the acid delivery nozzle are coupled thereto to introduce the acid into the chamber.

32. The apparatus of claim 1, wherein the acid delivery system comprises an acid reservoir.

33. The apparatus of claim 32, further comprising an acid reservoir cooling coil coupled to the acid reservoir, wherein the cooling coil operates to lower a temperature of the acid reservoir.

34. The apparatus of claim 1, wherein the acid delivery system comprises a device to regulate a rate of flow of the acid.

35. The apparatus of claim 34, wherein the device to regulate the rate of flow of the acid comprises an acid flow valve.

36. The apparatus of claim 34, wherein the device to regulate the rate of flow of the acid comprises an acid flow meter, and an acid flow valve, wherein the acid flow meter is coupled to the acid flow valve and reflects the flow of the acid.

37. The apparatus of claim 34, wherein the device comprises an acid flow controller that monitors an acid flow meter and adjusts an acid flow valve to maintain a rate of flow for the acid at a predetermined level.

38. The apparatus of claim 37, wherein the predetermined level comprises a programmable function of the acid flow controller.

39. The apparatus of claim 1, wherein the acid delivery system is capable of regulating an amount of the acid delivered into the chamber.

40. The apparatus of claim 1, wherein the acid delivery system introduces the acid into the chamber at different points within the chamber.

41. The apparatus of claim 41, wherein different points within the chamber comprise points below the distribution-blending-cooling dish, wherein the acid is diluted with water to give a diluted acid.

42. The apparatus of claim 1, wherein the acid delivery system comprises a vortex generator to generate a vortex of the acid.

43. The apparatus of claim 42, wherein the vortex generator comprises:

(a) a plurality of circulation eductors inside the chamber; and

(b) a pump, in fluid communication with the plurality of circulation eductors;

whereby the pump circulates the dilute acid through the plurality of eductors to initiate a movement of the dilute acid in a rotational direction to create a vortex.

44. The apparatus of claim 43, wherein the plurality of eductors are strategically placed inside the chamber at different elevations.

45. The apparatus of claim 43, wherein the direction of the plurality of eductors within the chamber exerts control over the rotational speed of the dilute acid and control over the size of the vortex.

46. The apparatus of claim 43, wherein the rotational speed of the dilute acid, and size of the vortex can maximize the thermal exchange of the acid with the wall of the chamber.

47. The apparatus of claim 43, wherein the acid and the base are mixed within a thin layer on the distribution-blending-cooling dish to form a suspension that contains hard particles of an un-reacted base, wherein the pump crushes the hard particle of the un-reacted base, and the acid delivery system delivers the un-reacted base or suspension thereof into the chamber via the distribution-blending-cooling dish.

48. The apparatus of claim 43, wherein the vortex enhances the *in situ* mixing within the chamber below the distribution-blending-cooling dish.

49. The apparatus of claim 1, wherein the base delivery system comprises:

(a) a base pump; and

(b) a base delivery nozzle, wherein the base pump and the base delivery nozzle are coupled thereto to introduce the base into the chamber.

50. The apparatus of claim 1, wherein the base delivery system comprises a base reservoir that contains the base.

51. The apparatus of claim 50, wherein the base delivery system further comprises a base reservoir cooling coil coupled to the base reservoir to lower temperature of the base reservoir.

52. The apparatus of claim 51, further comprising a base reservoir temperature sensor, coupled to the base reservoir; wherein the base reservoir temperature sensor senses the temperature of the base reservoir and the base reservoir cooling coil cooperating with the base reservoir temperature sensor to regulate the temperature of the base reservoir.

53. The apparatus of claim 1, wherein the base delivery system comprises a device to regulate a rate of flow of the base.

54. The apparatus of claim 53, wherein the device to regulate the rate of flow of the base comprises an acid flow valve.

55. The apparatus of claim 53, wherein the device to regulate the rate of flow of the base comprises a base flow meter, and a base flow valve, wherein the base flow meter is coupled to the base flow valve and reflects the flow of the base.

56. The apparatus of claim 53, wherein the device comprises an base flow controller that monitors an base flow meter and adjusts a base flow valve to maintain a rate of flow for the base at a predetermined level.

57. The apparatus of claim 56, wherein the predetermined level is a programmable function of the base flow controller.

58. The apparatus of claim 1, wherein the base delivery system is capable of regulating an amount of the base delivered into the chamber.

59. The apparatus of claim 1, further comprising a precipitate chamber allowing the precipitation of solids.

60. The apparatus of claim 1, further comprising a filter chamber filtering the mixture.

61. The apparatus of claim 1, further comprising a storage chamber storing the mixture.

62. An apparatus for blending an acid and a base to form a mixture, comprising:

(a) a chamber;

(b) a distribution-blending-cooling dish suspended therein;

(c) an acid delivery system for spraying the acid into the chamber and to the distribution-blending-cooling dish, wherein the acid delivery system is capable of regulating a rate of flow and an amount of the acid sprayed into the chamber; and

(d) a base delivery system for spraying the base into the chamber via the distribution-blending-cooling dish, wherein the base delivery system is capable of regulating a rate of flow and an amount of the base sprayed into the chamber;

wherein blending of the acid and the base comprises in-air mixing above the distribution-blending-cooling dish and proximate the acid delivery systems, progressive mixing continues within a thin layer on the surface of the distribution-blending-cooling dish, and *in situ* mixing occurs within the chamber below the distribution-blending-cooling dish.

63. The apparatus of claim 62, wherein the acid comprises sulfuric acid.

64. The apparatus of claim 62, wherein the acid is diluted in water.

65. The apparatus of claim 62, wherein the base comprises calcium hydroxide.

66. The apparatus of claim 62, wherein the base is mixed in water to form a slurry.

67. The apparatus of claim 62, wherein an inside surface of the chamber comprises of a non-corrosive coating.

68. The apparatus of claim 67, wherein the non-corrosive coating comprises a derivative of fluro polyerms.

69. The apparatus of claim 67, wherein non-corrosive coating comprises ethyl tetraflouro ethylene.

70. The apparatus of claim 62, further comprising a chamber cooling coil coupled to the chamber to lower temperature of the chamber.

71. The apparatus of claim 70, further comprising a chamber temperature sensor, coupled to the chamber, the chamber temperature sensor sensing temperature of the chamber, and the chamber cooling coil cooperating with the chamber temperature sensor to regulate the temperature.

72. The apparatus of claim 62, further comprising a dish cooling coil coupled to the distribution-blending-cooling dish to lower temperature of the distribution-blending-cooling dish.

73. The apparatus of claim 72, further comprising a dish temperature sensor, coupled to the distribution-blending-cooling dish, wherein the dish temperature sensor senses the temperature of the distribution-blending dish, and the dish cooling coil cooperating with the dish temperature sensor to regulate the temperature of the distribution-blending-cooling dish.

74. The apparatus of claim 62, wherein the distribution-blending-cooling dish comprises an adequate size and shape to allow broad distribution of the acid and the base components, and wherein cooling of the mixture occurs.

75. The apparatus of claim 62, wherein the distribution-blending-cooling dish comprises a minimal depth and shape to allow broad distribution of the acid and the base components, and wherein cooling of the mixture occurs.

76. The apparatus of claim 62, wherein the distribution-blending-cooling dish comprises a non-corrosive coating.

77. The apparatus of claim 76, wherein the non-corrosive coating comprises a derivative of fluro plymers.

78. The apparatus of claim 76, wherein non-corrosive coating comprises ethyl tetraflouro ethylene.

79. The apparatus of claim 62, wherein the acid delivery system comprises:

(a) an acid reservoir;

(b) an acid flow valve; and

(c) an acid flow meter;

wherein the acid reservoir that contains the acid is coupled to the acid flow valve that controls rate of flow of the acid, and is coupled to the acid flow meter that measures the flow of the acid.

80. The apparatus of claim 79, further comprising an acid reservoir cooling coil coupled to the acid reservoir to lower a temperature of the acid reservoir.

81. The apparatus of claim 79, wherein the acid flow meter is coupled to the acid flow valve and reflects the flow of the acid, wherein an acid flow controller monitors the acid flow meter, and the acid flow controller is capable of adjusting the acid flow valve to maintain a rate of flow for the acid at a predetermined level.

82. The apparatus of claim 81, wherein the predetermined level is a programmable function of the acid flow controller.

83. The apparatus of claim 62, wherein the acid delivery system is capable of regulating an amount of the acid delivered into the chamber.

84. The apparatus of claim 62, wherein the acid delivery system introduces the acid into the chamber at different points within the chamber.

85. The apparatus of claim 84, wherein different points within the chamber comprise points below the distribution-blending-cooling dish, wherein the acid is diluted with water to give a diluted acid.

86. The apparatus of claim 62, wherein the vortex generator comprises:

(a) a plurality of circulation eductor inside the chamber; and

(b) a pump, in fluid communication with the circulation injectors;

whereby the pump circulates the dilute acid through the plurality of injectors to initiate a movement of the dilute acid in a rotational direction to create a vortex.

87. The apparatus of claim 86, wherein the plurality of injectors are strategically placed inside the chamber at different elevations.

88. The apparatus of claim 86, wherein the direction of the plurality of injectors within the chamber exerts control over the rotational speed of the dilute acid and control over the size of the vortex.

89. The apparatus of claim 86, wherein the rotational speed of the dilute acid, and size of the vortex can maximize the thermal exchange of the acid with the wall of the chamber.

90. The apparatus of claim 86, wherein the acid and the base are mixed within a thin layer on the distribution-blending-cooling dish to form a suspension that contains hard particles of an un-reacted base, wherein the pump crushes the hard particle of the un-reacted base, and the acid delivery system delivers the un-reacted base or suspension thereof into the chamber via the distribution-blending-cooling dish.

91. The apparatus of claim 86 wherein the pump is a peristaltic pump.

92. The apparatus of claim 86, wherein the vortex enhances the *in situ* mixing within the chamber below the distribution-blending-cooling dish.

93. The apparatus of claim 62, wherein the base delivery system comprises:

(a) a base reservoir;

(b) a base flow valve; and

(c) a base flow meter;

wherein the base reservoir that contains the base is coupled to the base flow valve that controls rate of flow of the base, and is coupled to the base flow meter that measures the flow of the base.

94. The apparatus of claim 94, further comprising a base reservoir cooling coil coupled to the base reservoir to lower temperature of the base reservoir.

95. The apparatus of claim 79, wherein the base flow meter is coupled to the base flow valve and reflects the flow of the base, wherein a base flow controller monitors the acid flow meter and the base flow controller is capable of adjusting the base flow valve to maintain a rate of flow for the base at a predetermined level.

96. The apparatus of claim 96, wherein the predetermined level is a programmable function of the base flow controller.

97. The apparatus of claim 62, further comprising a precipitate chamber allowing the precipitation of solid particles.

98. The apparatus of claim 62, further comprising a filter chamber filtering the mixture.

99. The apparatus of claim 62, further comprising a storage chamber storing the mixture.